inducing a natural ignition of the fuel. Because only the air is compressed during the compression stroke, the Diesel engines do not induce any natural ignition of the fuel during the compression stroke. Thus, the Diesel engines can be designed to operate at a higher compression ratio of 12 - 24 which is considerably higher than that of the gasoline engines. The conventional Diesel engines inject the fuel into the combustion chamber by a fuel injector, and the injected fuel is continuously ignited for a long period from a time the piston moves from the upper dead point. However, because the fuel in the combustion chamber of the conventional Diesel engines is in contact with the compressed air for a short period different from the conventional gasoline engines, the Diesel engines are problematic in that the fuel cannot be sufficiently mixed with the compressed air.

[4] In an effort to overcome the problems of both the conventional gasoline engines and the conventional Diesel engines, a premixed charge compression ignition engine (PCCI engine) has been proposed and used. The PCCI engine results from a combination of the advantages of both the gasoline engines and the Diesel engines, thus inducing a lean burn of fuel, improving a fuel mileage and increasing an engine output power.

[5] The PCCI engine premixes fuel with air to provide a premixed charge, and induces a natural ignition of the premixed charge to generate power. Several types of conventional PCCI engines have been proposed. Examples of the conventional PCCI engines will be described herein below, with reference to FIGS. 1, 2 and 3 (use of the reference numerals shown in FIGS. 1, 2 and 3 is limited to the embodiments shown in the drawings).

[6] FIGS. 1 and 2 show a conventional PCCI engine disclosed in Korean Patent Application No. 1996-063089. As shown in FIGS. 1 and 2, the conventional PCCI engine comprises a cylinder head 1 provided with both a suction manifold 3 and an exhaust manifold 4. An air cleaner 10 is provided at an inlet of the suction manifold 3.

[7] The PCCI engine further includes a throttle body 7, a heater 8, and a temperature sensor 9. The throttle body 7 is installed at an intermediate position of the suction manifold 3 to control an amount of inlet combustion air. The heater 8 is provided on the suction manifold 3 at a position in front of the throttle body 7. The temperature sensor 9 is provided on the suction manifold 3 at a position in back of the throttle body 7. Both the heater 8 and the temperature sensor 9 respectively have electric circuits that are connected to an engine control unit 6 via electric wires.

[8] The PCCI engine having the above-mentioned construction executes an adiabatic

compression of a premixed charge of fuel and air at a high temperature and high pressure, and ignites the compressed premixed charge to burn the premixed charge. In the conventional PCCI engine, both the ignition quality and the lean burn air/fuel ratio vary according to a temperature of the inlet combustion air drawn into a combustion chamber 2. In a detailed description, the ignition quality is improved and the lean burn air/fuel ratio increases in proportion to an increase in the temperature of the inlet combustion air. In FIGS. 1 and 2, the reference numeral 5 denotes a fuel injector.

[9] FIG. 3 shows a conventional gasoline PCCI engine disclosed in Korean Patent Application No. 1999-0067615. As shown in FIG. 3, the gasoline PCCI engine comprises a combustion chamber 1 which is defined between a cylinder head 2 and a piston 3. Both a suction port 4 and an exhaust port 6 are provided at the upper end of the combustion chamber 1. The suction port 4 guides inlet air from a suction manifold 8 into the combustion chamber 1, while the exhaust port 6 discharges exhaust gases from the combustion chamber 1 to an outside of the engine.

[10] The suction port 4 is provided with a suction valve 5 to control the suction port 4, thus drawing a premixed charge of fuel and air into the combustion chamber 1. The exhaust port 6 is provided with an exhaust valve 5 to control the exhaust port 6, thus discharging the combustion gases from the combustion chamber 1 to the outside of the engine after a combustion of the premixed charge.

[11] In the conventional gasoline PCCI engine, a first injector 9 is installed in the suction manifold 8 to inject a predetermined amount of gasoline to the inlet air that flows through the suction manifold 8. Thus, the gasoline is premixed with the inlet air in the suction manifold 8, so that an ultra-lean premixed charge of gasoline and air is prepared in the suction manifold 8. When the fuel, which is the gasoline, is injected into the inlet air in the suction manifold 8, the fuel flows to the suction port 4 in a state of being premixed with the inlet air prior to being drawn into the combustion chamber 1. Therefore, the fuel is homogeneously mixed with the air to provide a homogeneous premixed charge.

[12] The gasoline PCCI engine further includes a second injector 10 of the direct injection type which is installed at the upper end of the combustion chamber 1 to inject a predetermined amount of fuel into the combustion chamber 1 at a last stage of an exhaust stroke. In the above state, the fuel is directly injected from the second injector 10 to a flow depression 11 that is formed on an upper end of the piston 3. Thus, the fuel flows in the combustion chamber 1 while tumbling, so that the fuel is homogeneously mixed with the air.